



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,186	10/16/2003	Sergey D. Lopatin	039153-0484 (G1190)	7567
26371	7590	04/18/2005	EXAMINER	
FOLEY & LARDNER 777 EAST WISCONSIN AVENUE SUITE 3800 MILWAUKEE, WI 53202-5308			NGUYEN, THANH T	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/687,186	Applicant(s) sm LOPATIN ET AL.	
	Examiner Thanh T. Nguyen	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-12 and 14-19 is/are rejected.
- 7) ☐ Claim(s) 9, 13 and 20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>1/21/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 4-8, 10, 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Paranjpe et al.(U.S. Patent No. 6,461,675).

Referring to figures 2, 6, Paranjpe et al. teaches a method of using an adhesion precursor in an integrated circuit fabrication process comprising:

Providing a gas (called precursor, see col. 12, lines 23-24) of first material over a dielectric material to form an adhesion precursor layer, the dielectric material including an aperture (see figure 1); and

Providing a gas including an alloying agent over the adhesion precursor layer to provide a copper layer over the adhesion precursor layer (called precursor, see col. 12, lines 24-26).

Regarding to claim 2, adhesion precursor include a barrier material (col. 12, lines 42-43).

Regarding to claim 4, providing a second gas of a second material over the adhesion precursor layer (called precursor, see col. 12, lines 24-26). Noted that second gas can be the gas of the alloy agent to form copper alloy.

Regarding to claim 5, second gas includes chromium (see col. 12, lines 40-44).

Regarding to claim 6, a third gas of the third material over a layer formed by the second gas (see col. 12, lines 32-38). Noted that the third material can be the same as the second material.

Claims 15-16, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Chang et al.(U.S. Patent Publication No. 2004/0105934).

Referring to figures 5a-5c, Chang et al. teaches a method of using an adhesion precursor for chemical vapor deposition, the method comprising:

Forming a trench (304H) in a dielectric layer (302);

Forming a continuous barrier layer (308) above the dielectric layer and along sides of the trench;

Depositing copper (310) above the continuous barrier layer, the copper located in the trench forming an integrated circuit feature, wherein the continuous barrier layer (308) includes a material selected from a group consisting of Ir, Ru, Re (see abstract, and paragraphs# 80).

Regarding to claim 16, the continuous barrier layer is formed from a gas having a ternary element (see paragraph# 59). Noted that the precursor gas containing at least ruthenium, oxygen, carbon and hydrogen.

Regarding to claim 19, feature is a via (see figure 5a).

Claims 15-16, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Drewery et al. (U.S. Patent No. 6,790,773).

Referring to figures 2a-3c, Drewery et al. teaches a method of using an adhesion precursor for chemical vapor deposition, the method comprising:

Forming a trench (202) in a dielectric layer (200);

Forming a continuous barrier layer (204/210/304) above the dielectric layer and along sides of the trench;

Depositing copper (212) above the continuous barrier layer, the copper located in the trench forming an integrated circuit feature, wherein the continuous barrier layer (204/210/304) includes a material selected from a group consisting of Ir, Ru, Re (see col. 5, lines 34-40, claim 16).

Regarding to claim 17, CMP the copper layer (see figure 2E, col. 7, lines 18-22).

Regarding to claim 19, feature is a via (see figure 2a).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 11, 14, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paranjpe et al.(U.S. Patent No. 6,461,675) or Drewery et al. (U.S. Patent No. 6,790,773), or Chang et al.(U.S. Patent Publication No. 2004/0105934) as applied to claims 1-2, 4-8, 10, 12, 15-17, 19 above in view of level of ordinary skill in the requisite art.

Paranjpe et al or Drewery et al. or Chang et al. teaches all of the limitation as described in Claimed invention above. However the reference does not teach the thickness of the layer.

The thickness range of the claims are considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. As noted in *In re Aller*, the selection of reaction parameters such as temperature and concentration would have been obvious:

Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed Acritical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.
In re Aller 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmscher* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used any thickness range and the concentration range suitable to the method in process of Paranjpe et al or Drewery et al. or Chang et al. in order to optimize the process.

Allowable Subject Matter

Claim 9 is allowed because none of the prior art alone or in combination teaches a step of the adhesion precursor layer includes a ternary element of iridium, ruthenium or rhenium.

Claims 13, 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).

Art Unit: 2813

A handwritten signature in black ink, appearing to read 'Thanh', with a long, sweeping horizontal stroke extending to the left.

Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN